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ABSTRACT

This paper examines the developmental problems of the environmentally disadvantaged in light of recent research; makes a case for intervention during infancy, and attempts to specify some concrete details of a curriculum for an Infant Educational System (IES). A rationale for infant education is presented and a vast amount of literature related to the problem of compensatory programs is reviewed. Much of this literature indicates the necessity of extremely early intervention (e.g. the irreversibility of the effects of early deprivation and the socioeconomic class differences in intellectual functioning found by 18 months of age). It is suggested that on the basis of research findings, the rationale and techniques for constructing a curriculum based on the development of an individualized instruction program are quite appropriate for the design of an IES curriculum arranged according to a series of developmental levels. It is specifically recommended that the infant's environment be carefully and scientifically structured through the use of autotelic stimulation. Also stressed are the importance of the learning facilitator (parent) and the importance of training parents to encourage infants' development. [Not available in hard copy due to marginal legibility of original document.] (MH)

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AN EDUCATIONAL SYSTEM FOR DEVELOPMENTALLY DISABLED INFANTS*

John Meier, Ph.D. and Leslie Segner, Ph.D.

Introduction

The literature is beginning to burgeon with reports of small experimental studies and massive intervention programs designed to compensate for the multiplicity of developmental disabilities suffered by young children with various physical and/or environmental deficits. The trend is toward earlier and more systematic intervention to compensate for whatever deficiencies can be identified, ameliorated, and ultimately prevented (Meier, 1969b; Meier & Martin, 1970b). Those who have reported quite favorable results from their intervention programs agree that the younger child is more suitable for properly planned prevention strategies. Thus, as a programmatic testimony that such programs as Head Start have been too late and inadequate, particularly for many children whose deficits are a function of the culture of poverty, a new thrust is being directed toward education for infants and toward more cognitive content in preschool programs. At the John F. Kennedy Child Development Center, several efforts along these lines have recently been instituted. This paper presents the rationale and a curriculum framework for an infant education system currently being researched and developed at the JFK Center and several field test satellites.

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Rationale for Infant Education

Research on the determinants of functional retardation has revealed that more than two-thirds of "slow learners" and "school failures" are educationally retarded on the basis of experiential deprivations which have left their scars before the child enters school (Bloom, 1964; Deutsch, 1967; Fowler, 1962; Hunt, 1961; Masland, Sarason & Gladwin, 1958; Reissman, 1962). The irreversibility of the effects of early deprivation makes it evident that social planning in the area of developmental disabilities must include prevention as a first priority. Although functional retardation usually has no demonstrable organic correlates, it is every bit as real and disabling to the individual as are the more grossly identifiable forms of brain damage and chromosomal defects. With knowledge that preventive environmental measures are possible, it is exigent to discover the most effective ways to intervene in this adverse developmental process which affects at least fifteen percent (Meier, 1969) of children entering school.

A primary thrust of the government's interventions in the poverty cycle has been the early childhood education efforts of Project Headstart. While it is unquestionable that the Headstart Program has promoted the social, physical, and emotional development of most of the children involved, recent evaluations have suggested that some basic reorientation and reorganization are necessary before this program can be of maximum benefit in facilitating intellectual growth and development. One of the major recommendations growing out of the Westinghouse Learning Corporation's assessment of Headstart (1969) is that intervention must begin prior to the preschool (four-year-old) period of development in order to be maximally effective.

The notion of education during the first three years of life is not a new one, and it receives support from knowledge of the critical significance of this developmental period for later learning and adjustment. Developmental services, including day care programs for infants and toddlers, are becoming a central part of the anti-poverty effort, e.g., the Federally-sponsored Parent-Child Centers, Community Coordinated Child Care (4-C), and Model Cities Programs. These programs provide a convenient means of implementing infant education programs for the disadvantaged children who need them most.

The literature on the effects of socio-economic class on development is uniform in its conclusion that there is strong, positive correlation between material disadvantage and intellectual deficit (Davis & Havighurst, 1946; Deutsch & Brown, 1964; Jones, 1954; Pavenstedt, 1965). Although it has been demonstrated repeatedly that children from the culture of poverty are at least equal to privileged children in sensori-motor abilities very early in life, by eighteen months of age the intellectual inferiority of the children of poverty becomes evident, and from that point on the curves of intellectual growth for the two groups show a continuing and increasing divergence (Bayley, 1965; Deutsch, 1968; Knoblock & Pasamanick, 1953).

In fact, Kagan (1968) has found that as early as four months of age, lower-class babies vocalize significantly less than do middle-class babies. Sears (1957) has hypothesized that the fundamental difference between lower- and middle-class child-rearing practices lies in the variable of "access to information." Bernstein (1961) has made a similar suggestion in his formulation of the linguistic difference between the classes. He suggests that communication in lower-class families is marked by an absence of verbal

elaboration and language-mediated internal cues, as contrasted to the highly elaborated nuances of communication found in the verbal interaction of middle-class families. This reliance of lower-class families on nonverbal and implicit modes of communication results in a lack of complex verbal input which is so necessary to the development of language fluency in young children. Since verbal facility has been shown to be the best predictor of later intelligence (Bayley, 1967), it is evident that ways must be found for providing children in the culture of poverty with models for adequate language development beginning in the earliest months of life.

One method of achieving this is that of instructing literate parents to set aside some time each day for reading to their infants. Irwin (1960) conducted an experiment in which lower-class mothers read to their infants for ten minutes a day, beginning at thirteen months of age. When tested after seven months of this treatment, the experimental infants were found to be substantially superior to a control group in all language functions.

Findings such as mentioned above, which suggest that environmental modification can alter the course of intellectual development, have formed the theoretical basis for programs of comprehensive early intervention with lower-class infants. A relatively large-scale study of education for infants and toddlers has been underway for several years under the direction of Keister at the University of North Carolina at Greensboro. This project was designed to demonstrate that growth-facilitating and educational experiences can be implemented through group day care facilities for children from birth to age three. Unlike the typical nursery situation in which working mothers leave their infants for group day-care, this program has a high ratio of care-givers to children, quality health care, and individualized educational programs geared to each child's particular needs. A preliminary report on

the evaluation of this project (Keister, 1969) compares fourteen infants treated in this enriched day care with fourteen home-reared infants matched on age, sex, race, and education of parents. The cooperating comparison families were presumably quite interested in their infants and thus not strict controls. There were no significant differences between the two groups on either the Bayley Scales of Infant Development or the Vineland Social Maturity Scale, administered regularly between 18 and 36 months of age. Children from both middle- and lower-class homes were included in this analysis but, unfortunately, the social class of the subjects was not discussed as a variable. From these data it is only possible to conclude that high quality group day care supports the infant's mental, motor, and social development equally well as well as rearing in a nurturant home environment.

The Children's Center in Syracuse, formerly under the direction of Caldwell (1967), is another experimental program in group day care for children of lower-class working mothers. This project is seeking to instill in infants and young children the foundations of a positive self concept, basic conceptual thinking, and enriched experiences with words and events. The primary goal of the program is to demonstrate that an enriched day care environment can offset the disadvantages of maternal separation and give additional cognitive and sensory input which the lower-class home is frequently unable to offer. Although a complete evaluation of the development of these children, in comparison to matched controls, has not yet been published, Caldwell's preliminary impressions of the effectiveness of the program are positive.

One issue which cannot be ignored in this discussion has to do with the effects of multiple mothering. On the basis of the results of Rheingold

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(1961) and Caldwell and Hersher (1964), it seems that the presence of more than one mothering person has no ill effects if all the "mothers" are effective and work together. The literature on Kibbutz-reared children (Spiro, 1958) certainly suggests that multiple mothering does not necessarily cause the child difficulties in the long run.

A longitudinal study of Negro males in New York City was recently reported by Palmer (1969) in which the experimental infants were given two one-hour training sessions a week in a one-to-one situation. There were two types of training: "concept training," which included systematic instruction; and "discovery," in which the same play materials were presented but with no instructions. After eight months of such training, which was begun at age two, both experimental groups were superior to controls on such diverse tasks as the Stanford-Binet Intelligence Test, language comprehension and use, perceptual discrimination, motor behavior, delayed reaction, and persistence at a boring task. This superiority of the trained groups was still present on retesting one year later. Palmer proposed four factors to account for this effect: 1) the regularity of exposure to a structured learning condition; 2) the affective relationship between instructor and child; 3) the uninterrupted nature of the instructor-child interaction; and 4) the increasing realization by the child that he could respond to stimulation and be rewarded for his response.

Probably the largest scale and most thoughtfully planned early education project undertaken to date is the one at the University of Florida under Gordon's direction. This program utilizes disadvantaged women to train other indigenous disadvantaged mothers in techniques of infant education to be used at home. A recent report (1969) of Gordon's findings

indicates that at the end of the first year of the project the children whose mothers had been given instructions in infant education were superior to control children on the Griffiths Mental Development Scales. At the end of the second year, the same differences obtained for the children who had been in the program from 3 months to 24 months of age, as well as for those who had participated from 12 months to 24 months of age. However, those children who were enrolled only from 3 months to 12 months of age were not significantly different from their controls, which suggests that the advantage gained during the first year is lost unless the education program continues during the second year of life. It is interesting to note that there was a language lag on both the Griffiths and Bayley Scales for both the children enrolled in the education program and their controls. This suggests that the language deficits in the environment of these children were not completely offset by the education program. However, the fact that the developmental quotients of the participant children were elevated in comparison to controls is encouragement for developing more effective programs.

There is an impressive body of evidence, from studies of both lower animals and human subjects, which points to the critical and pervasive influence of experience in infancy. Studies by Dennenberg (1964), Harlow (1963), and Levine (1960), with various kinds of laboratory animals, have all led to the conclusion that close physical contact and stimulation are essential for adequate physiological, emotional, and adaptive development. Another set of investigations relating to the importance of early experience has been concerned with critical periods of learning, particularly imprinting. The work of Hess (1967), Scott (1962), and others has suggested that in certain lower animals there exist functions capable of being learned only during

circumscribed periods of development. A third group of animal studies bearing on early experience has compared the social development and learning of animals raised in enriched environments with those raised in deprived environments. Thompson and Melzack (1956) found that dogs reared in cages providing minimal stimulation were disoriented and deficient in learning abilities when compared to dogs which had been reared in normal or enriched environments. Some more recent investigations (Bennett, Diamond, Krech, & Rosenzweig, 1964; Krech, Rosenzweig, & Bennett, 1962; Rosenzweig, Bennett, & Diamond, 1967; and Valverde & Marcos-Ruiz, 1968) have shown that rearing in enriched environments produces anatomical as well as biochemical differences in the brains of rats and mice. Not only were the experimental animals more proficient on problem-solving tests, but they were also found, on autopsy and histological studies, to have more of the enzyme associated with transmission of neural messages (acetylcholinesterase) in their brains and to have greater anatomical depth and dendritic proliferation in the cortical areas most involved in receiving and processing the enriched data.

The research relevant to infant education using humans has been mainly concerned with the consequences of maternal deprivation and institutionalization, and the developmental effects of handling and physical contact. Early studies on the effects of maternal deprivation (Bowlby, 1951; Spitz, 1946), were alarmingly grim in their description of the devastating and lasting consequences of early lack of mothering. Subsequent investigations (Dennis & Najarian, 1957; Goldfarb, 1955; Provence & Lipton, 1962) have led to similar, although less severe, conclusions. In essence, they have shown that children deprived of a consistent mothering figure in early life are significantly behind normal children on almost all measures of growth and

development. The most strikingly deficient areas are language behavior and social competence.

Since neither institutionalization nor mothering are pure or unitary variables, subsequent investigations have endeavored to isolate the factors in the mothering process which are crucial for the infant's development. One such factor which is now known to be basic is the handling of the infant. Brody (1951) reports that visual attentiveness in infants is highly and positively correlated with the amount of handling by the caretaking person. Studies by Casler (1965), Rheingold (1961), and White, Castle & Held (1964) have shown that additional handling and attention of institutionalized infants facilitates their development and increases their alertness. The explanation for this phenomenon probably lies in the relationship between physical contact and visual curiosity. Spitz (1946) has suggested in his formulation of the "cradle of perception" that the infant can only begin to see and learn about his environment through his close physical relationship with his mother. Along these lines, Korner and Grobstein (1967) recorded the visual scanning behavior of twelve neonates, and observed that their eyes were open ninety percent of the time when being held, and only twenty-five percent of the time when either left unhandled or moved to a sitting position. Clearly, this finding suggests that the development of early visual-motor schemata is facilitated by handling, since it is known even at this young age that the child can discriminate between visual cues (Fantz, 1967). Yarrow (1963) found a similar result in a study of children in foster care. He discovered a significant correlation between developmental test scores at six months, and ratings of amount of appropriateness of maternal handling. In the same vein, Rubenstein (1967) reported a

significant positive relationship between ratings of maternal attentiveness and measures of exploratory behavior and preference for novel stimuli in five-month-old infants.

In a different tradition from the aforementioned studies of the effects of early experience, the work of Piaget (1952) has equally important theoretical significance. The relevance of Piaget's work for the rationale for infant education lies in its emphasis on the critical importance of the earliest learning experiences. His work clearly implies that the later expression of intelligent behavior has its roots in the schemata laid down during the earliest months and years of life. Piaget's observations on the continuity of development point to the cumulative nature of intelligent behavior, which he conceptualized as a sequential unfolding process. Although he did not discuss the effects of deviant environmental circumstances such as environmental deprivation or inborn handicaps on cognitive development, one can infer that without intensive exchange between the infant and his environment during the sensori-motor period (the first eighteen months), there will necessarily be impairment of later adaptation and intellectual growth.

Infant Education Curriculum

A couple of years ago, Barsch (1967) wrote a chapter in a book about exceptional children which he entitled, "The Infant Curriculum - A Concept for Tomorrow." The chapter was the last of a series of contributions from experts of many disciplines writing in regard to the exceptional, or more specifically, the developmentally disabled infant. It seemed quite fitting, after having presented the multiplicity of problems which occur in very early childhood from the viewpoint of numerous disciplines, that some prescription

for the amelioration or, even better, the prevention of such disabilities be offered. Certainly Barsch's interest and sophistication in the perceptual-motor development of the human organism qualified him to make informed recommendations about the optimal development of the human organism, particularly where efficient perceptual-motor functioning is concerned. However, as a reflection of the state of the art, Barsch admittedly had precious few concrete methods and materials to suggest in behalf of the education of infants.

> "The optimal content of this paper should be a carefully documented presentation of an Infant Curriculum which has already been tested and tried over a period of time and had a profitable outcome. The sequences of stimulation should be precisely described in handbook style as a ready reference for any parent or clinician who wished to pursue the same course with a given infant. It should be possible, perhaps, to have developed the curriculum to such a point of clarity that specific sequences might have been studied in each perceptual mode so that remedial sequences might be strategically employed to the benefit of those infants who have suffered specific losses or impairments. Unfortunately, the concept of an Infant Curriculum is far from such an advanced stage of development...." (1967, p. 553)

> "Some day in the future it might be possible to present a detailed listing of stimulation sequences which have been scientifically organized on the basis of a simplicity to complexity continuum much in the same manner as we can now prescribe a remedial course for the failing reader. For the present, however, we must content ourselves with providing an outline and a few suggestions and hope that those who find this an acceptable concept will fill in the details from their own creativity and dedication...." (1967, p. 562)

The preceding section dealing with the rationale for infant education suggested that a number of research studies support the notion of infant education and early compensatory intervention for high-risk infants and toddlers. The Bayley Infant Scales of Psychomotor and Mental Development (1969), the corresponding efforts by Uzgiris and Hunt (1969), the Yale Developmental Schedules (which incorporate much of the Gesell Institute findings), and the more gross screening devices such as the Denver Develop-

mental Screening Test (Frankenburg and Dodds, 1969) all indicate that there are specific behaviors and capabilities which are expected of children at various chronological ages. These developmental milestones serve as guides to the systematic education of infants who have not attained the expected level of achievement as specified by various students of early childhood development.

Some first approximations to a curriculum for infant education have been developed and tested by Caldwell (1967), Gordon (1969), Gray (1968), Weikart (1967), and others. The preliminary findings from their efforts to train indigenous paraprofessionals to assist parents in helping their infants to achieve the various prescribed developmental milestones have been encouraging. There are many opponents to such intervention and many others who are either lukewarm to the idea or feel ill-prepared to implement such programs and thus remain adamantly uncommitted to any specific formulation of an individualized curriculum complete with entry behaviors and terminal objectives. Some of the reluctance on the part of child development specialists is due to a genuine, albeit romantic, appreciation for the pristine innocence of the infant. Some already harassed parents prefer the greater convenience of having a more passive infant and of not having to busy oneself about the additional task of tending to educational experiences for infants whose toileting, feeding, and sleeping needs are already too much for the harried mother to accomplish. The reticence frequently is also a function of a lack of familiarity with even the rudimentary requirements of curriculum building.

It is herein suggested that the rationale and techniques for constructing a curriculum based on the development of an individualized instruction program is quite appropriate for the design of an infant education curriculum.

As a matter of fact, the entry and terminal behaviors, particularly in the realm of sensory-motor-perceptual functioning have already been rather thoroughly delineated by the observable behaviors enumerated in the aforementioned infant appraisal instruments. For example, Item 42 on the Bayley Infant Scale for Psychomotor Development specifies that a child should be able to walk with help some place in the age range between seven and twelve months. This criterion performance, then, indicates whether or not a child of sixteen months chronological age should be given additional experiences to enable him to carry out the sensory-motor-perceptual functions requisite in walking with someone holding his hands. Thus, the terminal behavior for a given learning episode is to be able to perform a given task at criterion level. If an infant is unable to accomplish this task then it is necessary to go back to previous tasks until a point of mastery of the criterion performance is established. From this point of mastery, perhaps Item 40, Stepping Movements or Item 38, Stands up by Furniture, to the desired point of achievement a step-by-step sequence of training would be instituted and practiced until mastery of the underlying skills and understandings is accomplished.

Although this procedure involves educating youngsters to successfully perform on test items, there is nothing inherently wrong in this provided that the test items sample behaviors which are universally recognized as essential indices of normal infant growth and development.

> "The accurate appraisal of the many splendored phenomena comprising a young child's behavioral repertoire has been a challenge to psycho-diagnosticians for several decades. Even before Froebel's six gifts and Binet's bead-stringing and cube-stacking exercises some standard quantified gradations of tasks had been developed to assess some of the kaleidoscopic aspects of human functioning. However, only recently has there been a concerted effort to zero

> in on specific components of a young child's cognitive, affective and conative abilities for scientific diagnostic and prescriptive pre-school programming...." (Meier, 1967, p. 175)

It is not suggested that the specific test items prescribed on the developmental assessment instruments constitute the entire curriculum, but the behaviors which are sampled are considered important enough and reliable and valid enough that their mastery is deemed desirable. Karp & Sigel (1965) make a strong case for a test's truly reflecting the desired constellation of terminal behaviors.

> ".....tests and trained observation should take on new meaning and different diagnostic significance. In addition to appraising learning difficulty, measurement and observation should lead to remedial and compensatory techniques which can be incorporated readily into the curriculum and translated easily into work in the classroom. Psychoeducational appraisal of the disadvantaged pupil confronts us anew with the need to develop assessment procedures that both clarify the mechanisms by which learning occurs and guide the teaching-learning process." (pp. 409-410)

A history of the intelligence-testing movement clearly demonstrates that standardized tests comprise a distillation of those skills and abilities which are most validly and reliably assessed and communicated to or replicated by other investigators. Therefore, it is unnecessary to be apologetic or surreptitious about employing the current and rather well-conceptualized series of behaviors contained in various infant assessment instruments at least as the skeletal framework for an infant curriculum. The fleshing out of such a curriculum is both a function of the individual infant, whose idiosyncratic style of dealing with his environment requires an equally individual match of educational experiences suitable to his learning style and a function of the ingenuity of the learning facilitator, who by trial and error attempts to respond (real response ability) to the infant's needs. The appropriateness of items on standardized test instruments is challenged

by many defenders of the culture of poverty. Wechsler makes a cogent reply to this criticism.

> "The I.Q. has had a long life and will probably withstand the latest assaults on it. The most discouraging thing about them is not that they are without merit, but that they are directed against the wrong target. It is true that the results of intelligence tests, and of others, too, are unfair to the disadvantaged, deprived and various minority groups but it is not the I.Q. that has made them so. The culprits are poor housing, broken homes, a lack of basic opportunities, etc., etc. If the various pressure groups succeed in eliminating these problems, the I.Q.'s of the disadvantaged will take care of themselves." (p. 66)

Furthermore, as field test efforts proceed to empirically validate curricular content, new methods and materials inevitably are generated, much as necessity is the mother of invention. The extensive writings about observations of child growth and development in various natural settings by such authors as Church (1966), Gesell, et al. (1943), Piaget (1952), Terman (1925), and others help to bridge gaps in the framework circumscribed by the aforementioned infant assessment instruments.

Barsch concludes his chapter by suggesting several considerations which seem appropriate for this effort:

> "During the gestational process of the concept of an Infant Curriculum (1) the dynamics of deviancy must be considered a generic factor of homogeneity across disability populations (2) the multiplicity matrix of primary, secondary and tertiary deviations must be regarded as the singular focus (the matrix is the unit of concern (3) a multi-disciplinary and a multi-specialty approach must be the governing professional identification and (4) a loose period of cognitive exploration and implementation must precede any effort to exercise rigorous experimental procedures...."

As implied in the preceding rationale section, there are several assumptions underlying the notion that systematic education of infants facilitates their optimum development. A basic assumption is that the developmental process occurs as the result of a simultaneous mutual interaction between

biological mechanisms and environmental factors (Bigge & Hunt, 1962), that is, the organism does not develop without use. Secondly, it is assumed that the infant actively seeks the stimulation required for his growth. A third assumption is that information is processed and the infant develops only when he performs certain learning acts within certain kinds of surroundings. A fourth assumption, stated by Bloom (1964), is that the first three years are a critical period for intervention and "feeding" emerging abilities, because of the unparalleled growth of intelligence during this period. The fifth assumption is that the disproportionate amount of developmental disabilities in environmentally deprived children is due to either inadequate or inappropriate education during the earliest years of life. Finally, the present thesis is that corrective measures can be implemented with these high risk infants to prevent later intellectual deficits.

The I.E.S. program is arranged according to a series of developmental levels rather than going by a strictly chronological plan. In identifying these developmental levels, the major considerations are the infant's response repertoire at various stages, and the types of incentive which are most reinforcing. Because of the many unknown variables in the child's early perceptual-motor development, intuitive judgments have to be made in initially deciding when the child is ripe for various kinds of sensory input. Another variable that is poorly understood is the role of social reinforcement in stimulation programs. Since no feasible way exists nor is any effort made to eliminate the human factor, this is a variable which remains essentially uncontrolled.

In spite of the many unknowns which exist in our knowledge of early cognitive development, there are some facts supported by research which can

serve as guidelines in planning infant curriculum. It is known that vocalizing to the baby makes him more vocal (Luria, 1966; Meier, 1969a). Simple as this principle may sound, its application is the cornerstone of any infant education program. One practical suggestion to help accomplish this is to equip the parent (learning facilitator) with an infant backpack which enables the parents to talk with the infant rider while doing routine household chores. Another simple, but equally important, principle is that smiling, playing with, and socially responding to the baby make him more alert and socially responsive. Giving him an opportunity to practice his emerging sensorimotor skills will help him learn about himself in space, and also give him variety in color, form, pattern, shadow, and movement. In fostering speech, it is known that associating words with as many actions and stimulus qualities as possible facilitates learning. Another item of significance gained from recent research (Bower, 1966; Fantz, 1965) is that infants are capable of perceiving in all modalities from a very early age. This knowledge that the infant can register all sensory input, even if he can't process it in the same way that adults do, represents a tremendous advance. The research findings on stimulus parameters such as novelty and complexity (Fantz, 1967; Friedlander, 1968; McCall & Kagan, 1967) also provide helpful guidance.

It is well to keep in mind the caution against overstimulating the infant, and trying unwisely to speed up those processes which must wait for nature's timeclock. While it has been shown that the infant has built-in protection against information overload in the form of the stimulus barrier (Benjamin, 1965), caution must be used in introducing new experiences and tasks only when the child has demonstrated readiness. Another caution that must be exercised in the design of the I.E.S. is that it not be simply a

coaching device to prepare babies to pass items on the developmental scales. Such an approach is analogous to a high school education consisting of drilling on all the items which might occur on the College Board Exams. Although it is impossible to avoid the use of the blocks, rattle, ring and other familiar items used in the developmental exams in planning an infant's curriculum, the goals of their use should be conceptualized as something other than trying to beat the game by teaching the baby to make a 3-cube tower long before Gesell says that normal babies do it. Rather than concentrating on the manipulation of objects per se, one of the earliest goals of the program is going to be to get the baby to attend and respond to the human face as a distinctive stimulus. Kagan (1968) has observed that as early as four months of age there are significant differences in the attentional responses of lower- and middle-class children. Although the lower-class babies attended visually to a drawing of a human face for as long as middle-class babies, they did not show a deceleration in heart beat, which has been shown to be a physiological correlate of attention (Lewis, et al., 1966). Kagan suggests that this finding is due to the fact that the face is not a distinctive stimulus for the lower-class infants, because they have not experienced repeated presentations of the mother's face smiling down at them against a background of quiet. Because of crowded living conditions and other factors, the lower-class infant has experienced the mother's face under more confusing stimulus bombardment (the television blaring, other siblings' voices and faces, etc.) and has not formulated it as a distinctive schema.

In structuring the early environment of the environmentally deprived child, it is important to recognize that the problem is often not a lack of stimulation, but rather a lack of appropriate circumstances in which to

organize and assimilate stimulation (Deutsch, 1968). The idea is not to indiscriminately bombard the baby by attaching bright, moving objects and noise makers to his crib. Since the noise level around his crib is probably already too high, what is important is to provide a quiet background against which he can attend to and integrate new, carefully programmed educational experiences.

Since the foundation and necessary prerequisite for the baby's learning experiences is a trusting relationship with his learning facilitator, the importance of the early establishment of affectional relationships cannot be overstressed. There is much to be learned from observations of normal, nurturing mothers, and the ways in which they expose their babies to new experiences and communicate with them. One advantage of teaching mothers to set aside portions of the day for playful interaction with their babies is that the fulfillment which the mother experiences in such interactions will probably reinforce the frequency of their occurrence. It is believed that this will initiate a cycle of interactions in which the mother is pleased and rewarded by seeing her baby learn new things, and will seek more of these positive experiences by spontaneously talking to and playing with him more.

If an infant curriculum is to have maximum impact on the culture of poverty it is exigent that it be conceptualized in a simple and highly specific fashion. Very little sophistication can be assumed on the part of the parents, who are the prime facilitators of the infant curriculum. In order to design a conceptual framework for the curriculum, an Infant Education System (I.E.S.) Flow Chart is herein proposed (see Figure 1). The I.E.S. requires that a determination be made of what an infant or child is able to do and at what points along the developmental pathways he either lags behind

or deviates from the norms in a noteworthy way. Thus, the learning facilitators, in most cases the child's parents, present the child with a graded series of entry behavior tests in a relatively standardized fashion. A record form is provided and, after it is clearly understood by the learning facilitators, is used to record a child's responses to whatever experiences are presented. The nature and pattern of the behaviors observed in response to the test items serve to identify the appropriate learning episodes to be introduced next as parts of the child's lesson plan. Thus, the series of observable behaviors listed in the diagnostic portion of the educational system serves to key in the learning facilitator to a program of intervention. Each cluster of learning episodes is organized into a hierarchy of tasks which are most probable for attracting and maintaining the infant's interest and for efficacy in enabling him to achieve the desired behaviors.

Some examples of the elaborated flow system are presented in Figure No. 2 which depicts the small portion of Figure 1 that is cross-hatched and elaborates upon it. Based upon the Inventory of Infant Milestones, the learning facilitator is cued into a specific series of learning episodes. For example, if the child's babbling is not developing according to norms, specific experiences are selected and presented to the infant in various ways. If the more elegant crib attachments are not available, less sophisticated and usually more timeconsuming options are available for parents to carry out in person. Since speech is an imitative function, the input is carefully articulated on the automated devices or by the learning facilitator and the child is given ample opportunity to imitate this.

Since many of the experiences to which an infant might be exposed can be presented mechanically, Friedlander (1968); Grassi (1968); Kagan (1967);

Lipsitt (1968); Meier (1967 & 1969c); and others have experimented with various infant education content and media for conveying it. As a result of considerable work with new media and the advent of subsequent children in the family, requiring geometrically greater amounts of time per child in spite of a fixed availability of hours in the day, Meier devised several pieces of equipment and used existing as well as developed some new hardware and software for presenting various stimuli to these infants and toddlers. Practically, the first environment which is amenable to controlled intervention and allows observable results is the crib. A series of mechanical crib attachment devices was developed and tested; the control unit, one version of which is shown in Figure 3, is the nucleus of such a system and enables the infant to control much of his environment as described below. Various designs of hardware and an even greater variety of software were tested under relatively controlled conditions. It was the next generation of infant environments subsequent to that which Skinner designed for his own grandchildren. The essential motive for substituting various mechanically mediated stimuli for adult contact is not a mechanistic rejection of the affective domain but rather an attempt to use media to complement and supplement the adult affective and cognitive stimuli which are inevitably diminished with each successive child due to the accumulating demands on a fixed amount of time expressed by the other children in the same home.

The overriding principle guiding the introduction of any new piece of hardware or software is that the infant must be able to control it himself and find it attractive. This is consistent with the notions of an autotelic (intrinsically attractive and rewarding) responsive environment (Moore & Anderson, 1968) which this writer suggests is a cogent rationale for develop-

ing positive feelings and the confident knowledge necessary for competent manipulation of one's environment (Meier, 1970a & 1968a; Nimnicht, McAfee & Meier, 1969). The nucleus of the hardware system is an infant-controllable unit by which he can summon adult assistance by pressing a buzzer button; or he can initiate a recorded series of visual and auditory stimuli presented by such devices as a single concept film loop projector, a videotape recorder, an audiotape recorder, a pretuned radio, or other similar devices; or he can administer to himself a pre-determined amount of tactile-kinesthetic sensation by activating a vibrator or a heart-beat simulator; or he can control the level of illumination in the room; or, in the more sophisticated unit, he can even control such things as a fan to circulate the air or a warming pad, or remotely raise and lower the shade on the window. Most of the devices can be equipped with time delay switches to allow them to run a predetermined length of time and then turn off; they have to be reactivated by the infant to continue and a counter indicates how autotelic certain items are.

All of the auditory, visual and tactile-kinesthetic stimuli are controlled by a unit that is easily reached and manipulated by the infant, even while lying on his back or side in the crib or playpen. In addition, several interchangeable manipulanda are singly dangled over the child within his reach and when pulled can either activate a sound such as a bell or buzzer or can activate a motorized mobile suspended over the crib. Thus, the infant learns to control a certain amount of the environment and is the active recipient of various carefully selected stimuli programmed for his optimal learning. The format of the new educational program entitled "Sesame Street" is a good example of the kind of approach which is appropriate for presentation to the

infant. Similar material with considerable redundancy is what comprises the software programs which are available to the learner; Friedlander (1968 and 1969) has clearly documented that infants prefer a certain amount of redundancy. Counters are used to determine the number of times each stimulus is selected and as a child's rate of selection per unit of time peaks and begins to fall off, the content of that particular modality's stimulation is altered by replacing the now monotonous item with a novel and presumably slightly more complex experience. The learning facilitator (parent) is responsible for making these selections according to the instructional system and his/her own intuition regarding the child's response to previous stimuli. The learning facilitator is also instructed to reinforce any efforts the infant learner makes toward imitating the sounds or identifying the visual items, etc. The learning facilitator has a series of language and sensory-motor-perceptual tasks to perform with the infant in addition to keeping the hardware properly programmed with the available software, whose contents have already been empirically validated (see Figure 4 for sequence) or at least theoretically conceptualized to conform with the overall instructional system. Of course, the materials become progressively more complex and the training of the learning facilitators is necessarily continuous. Hence, the learning facilitator is an integral link in the chain of curriculum development and the training which these parents receive is a critical factor in the success or failure of a sensitively responding environment and Infant Education System.

REFERENCES

Barsch, R. The infant curriculum, a concept for tomorrow; Exceptional Infant, Vol. I, J. Hellmuth (Ed.), Seattle: Special Child Publications, 1967, 645-668.

Bayley, N., Cameron, J. & Livson, N. Infant vocalization and their relationship to mature intelligence. Science, 1967, 157, 331-333.

Bayley, N. & Schaefer, E.S. Relationships between socio-economic variables and the behavior of mothers toward young children. J. Genet. Psychol., 1960, 96, 61-77.

Bayley, N. Scales of Mental and Motor Development. New York: The Psychological corporation, 1969.

Benjamin, J.D. Developmental biology and psychoanalysis. Psychoanalysis and current biological thought; N.S. Greenfield and W.C. Lewis (Eds.) Madison: University of Wisconsin Press, 1965, 57-80.

Bennett, E.L., Diamond, M.C., Krech, D., & Rosenzweig, M.R. Chemical and anatomical plasticity of the brain. Science, 1964, 146, 610-617.

Bernstein, B. Social class and linguistic development: A theory of social learning. A. Halsey, J. Floud & C. Anderson (Eds.). Education, Economy and Society. New York: The Free Press of Glencoe, Inc., 1961, 288-314.

Bigge, M. & Hunt, M. Psychological Foundations of Education. New York: Harper, 1962.

Bloom, B.S. Stability and change in human characteristics New York: Wiley, 1964.

Bower, R.G.R. The visual world of infants. Scientific American, 1966. 80-92.

Bowlby, J. Maternal care and mental health. World Health Organization, 1951.

Brennan, W.M., Ames, E.W. & Moore, R.W. Age differences in infants attention to patterns of different complexities. Science, 1966, 151, 355-356.

Brody, S. Patterns of mothering. New York: International Universities Press, 1951.

Caldwell, B.M. & Richmond, J.B. Programmed day care for the very young child. A preliminary report. J. of Marriage and the Family, 1964, 26, 481-488.

Caldwell, B.M. What is the optimal learning environment for the very young child? Amer. J. Orthopsychiat., 1967, 37, 8-21.

Caldwell, B.M. & Hersher, L. Mother-infant interaction during the first year of life. Merrill-Palmer Quart., 1964, 10, 119-128.

Caldwell, B., Richmond, J. Social class level and stimulation potential of the home. Special Infant, J. Hellmuth, (Ed.), Seattle: Special Child Publications, 1967, 455-466.

Casler, L. The effects of extra tactile stimulation on a group of institutionalized infants. Genetic Psychology Monographs, 1965, 135-175.

Church, J. (Ed.) Three Babies' Biographies of Cognitive Development. New York: Random House, 1966.

Davis, A. & Havighurst, R.J. Social class and color differences in child rearing. Amer. Sociol. Rev., 1946, 11, 689-710.

Denenberg, V.H. Critical periods, stimulus input and emotional reactivity: A theory of infantile stimulation. Psychol. Rev., 1964, 71, 335-351.

Dennis, W. & Sayegh, Y. The effect of supplementary experiences upon the behavioral development of infants in institutions. Child Develop., 165, 36, 81-90.

Deutsch, M. & Associates The Disadvantaged Child. New York: Basic Books, 1968.

Deutsch, M. & Brown, B. Social influence in Negro-White intelligence differences. J. Social Issues, April, 1964, 24-35.

Dittman, L.L. Early Child Care: The New Perspectives. Atherton Press, 1968.

Drillien, C. The growth and development of the prematurely born infant. Baltimore: Williams & Wilkins, 1964.

Fantz, R.L. Pattern vision in newborn infants. Science, 1963, 140, 296-297.

Fantz, R.L. Visual perception from birth as shown by pattern selectivity. Whipple, H.F. (Ed.), New Issues in Infant Development. Annals of the New York Academy of Sciences, 118, 793-815, 1965.

Fantz, R.L. & Nevis, S. Pattern preferences in perceptual cognitive development in early infancy. Merrill-Palmer Quart., 1967, 13, 77-108.

Frankenburg, W. & Dodds, J. Denver Developmental Screening Test - Manual. Denver: Univ. of Colo. Medical Center, 1969.

Foss, B.M. Determinants of Infant Behavior. New York: Wiley, 1966.

Fowler, W. Cognitive learning in infancy and early childhood. Psychol. Bulletin, 1962, 59, 116-152.

Friedlander, B.Z. The effect of speaker identity, voice inflection, vocabulary and message redundancy on infants' selection of vocal reinforcement. J. Exper. Child Psychol., 1968.

Gesell, A. & Amatruda, C. Developmental Diagnosis. New York: Hoeber, 1941.

Gesell, A., Ilg, F., Learned, J., & Ames, L. Infant and Child in the Culture of Today. New York: Harper & Rowe, 1943.

Goldfarb, W. Emotional and intellectual consequences of psychological deprivation in infancy: A re-evaluation. P. Hoch & J. Zubin (Eds.), Psychopathology of Childhood. New York: Grune & Stratton, 1955, 105-119.

Gordan, I. Early Child Stimulation Through Parent Education: A final report to the Children's Bureau. Gainesville: Univ. of Florida Press, 1969.

Gordan, I. & Associates. Relationships between selected family variables and maternal and infant behavior in a disadvantaged population. Gainesville: Univ. of Florida Press, 1969.

Gordan, I. & Lally, J. Intellectual Stimulation of Infants and Toddlers. Gainesville: Univ. of Florida Press, 1967.

Gray, S. Project DARCEE Progress Report. Nashville, Tenn.: Unpublished, 1967.

Harlow, H.F. The maternal affectional system. Foss, B.M. (Ed.), The Determinants of Infant Behavior. New York: John Wiley & Sons, 1963, 3-33.

Hess, E.H. Ethology. A.M. Freeman & H.I. Kaplan (Eds.). Comprehensive Textbook of Psychiatry. Baltimore: Williams & Wilkins, 1967, 180-189.

Hoopes, J. An Infant Rating Scale: It's Validation and Usefulness. New York: Child Welfare League of America, 1967.

Hunt, J. McV. The psychological basis for using preschool enrichment as an antidote for cultural deprivation. J. Hellmuth (Ed.), Disadvantaged Child, Vol. I., Seattle: Special Child Publications, 1967, 255-299.

Hunt, J. McV. Intelligence and Experience. New York: The Ronald Press, 1961.

Inventory of Home Stimulation for Ages 3 to 6. Children's Center, Syracuse University, Syracuse, N.Y., 1969.

Irwin, O.C. Infant Speech: Effect of systematic reading of stories. The J. of Speech & Hearing Research, 1960, 3, 187-190.

Jones, H.E. The environment and mental development. Manual of Child Psychology, L. Carmichael (Ed.). New York: John Wiley, 1954, pp. 631-696.

Kagan, J. On cultural deprivation. D. Glass (Ed.), Proceedings of the Conference on Biology and Behavior. New York: Rockefeller Univ. Press, 1968, 211-250.

Kagan, J. & Lewis, M. Studies of attention in the human infant. Merrill-Palmer Quart., 1965, 11, 95-127.

Kagan, J. Continuity in cognitive development during the first year. Merrill-Palmer Quart., 1969, 15, 101-120.

Kagan, J., Henker, B., Hen-Tov, A., Levine, J., & Lewis, M. Infants' differential reactions to familiar and distorted faces. Child Development, 1966, 37, 519-532.

Keister, M.E. A demonstration project: the good life for infants and toddlers. A paper presented at a symposium sponsored by the Day Care Council of New York, Inc., 1969.

Knobloch, H. & Pasamanick, B. Further observations on the behavioral development of Negro children. J. Genetic Psychology, 1953, 83, 137-157.

Korner, A. & Grobstein, R. Visual alertness as related to soothing in neonates: Implications for maternal stimulation and early deprivation. Child Development, 1967, 37, 867-876.

Krech, D., Rosenzweig, M.R. & Bennett, E.L. Relations between brain chemistry and problem-solving among rats raised in enriched and impoverished environments. J. Comp. Physiol. Psychol., 1962, 55, 801-807.

Krech, D., Rosenzweig, M.R. & Bennett, E.L. Effects of environmental complexity on brain chemistry. J. Comp. Physiol. Psychol., 1960, 53, 509-519.

Krech, D., Rosenzweig, M. & Bennett, E. Environmental impoverishment, social isolation, and changes in brain chemistry and anatomy. Physiology and Behavior. London: Pergamon Press, 1966.

Levine, S. Stimulation in Infancy. Scientific American, 1960.

Lewis, M. & Goldberg, S. Perceptual-cognitive development in infancy: A generalized expectancy model as a function of the mother-infant interaction. Merrill-Palmer Quart., 1969, 15, 81-100.

Lewis, M., Kagan, J., Campbell, H. & Kalafat, J. The cardiac response as a correlate of attention in infants. Child Develop., 1966, 37, 63-71.

Lubchenco, L. High Risk Infant Follow-Up Study. Unpublished Progress Report, 1969.

Luria, A.R. Human Brain and Psychological Processes. New York: Harper & Rowe, 1966.

Mallitskaya, M.K. A method for using pictures to develop speech comprehension in children at the end of the first and in the second year of life. Voprosy Psikhol., 1960, No. 3, 122-126.

Masland, R.L., Sarason, S.B. & Gladwin, T. Mental Subnormality. New York: Basic Books, 1958.

McCall, R.B. & Kagan, J. Attention in the Infant: Effects of complexity, contour, perimeter, and familiarity. Child Develop., 1967, 38, 938-952.

Mehler, J., Bever, T.G. Cognitive capacity of very young children. Science, 1967, 158, 141-142.

Meier, J. An Autotelic Nursery School, in J. Masserman (Ed.) Psychiatric Therapy Quart., Vol. 70, (in press - 1970a).

Meier, J. Causes and Characteristics of Communication Disorders in Elementary School Children. In Proceedings for the Division for Children with Communication Disorders meeting at the 47th Annual International Convention of the Council for Exceptional Children, 1969a.

Meier, J. Developmental Disabilities and Problems of Intellect. Paper presented at Symposium in Spina Bifida, Univ. of Colo. Medical Center, 1969b.

Meier, J. Innovations in Assessing the Disadvantaged Child's Potential. In J. Hellmuth (Ed.) Disadvantaged Child, Vol. I. Seattle: Special Child Publications, 1967, pp. 173-99.

Meier, J. Some Results of New Nursery School Language Research. Childhood Education, 1968, 45:4, pp. 228-36.

Meier, J. & Martin, H. Diagnosis and Management of Developmental Retardation. In H. Kempe, H. Silver, & D. O'Brien (Eds.) Pediatric Current Diagnosis and Treatment. Los Altos, Calif: Lange (in press - 1970b).

Meier, J. Proposal for an Infant Education Project. Mimeo, 1969c.

Moore, O.K. Autotelic Responsive Environments and Exceptional Children. Mimeographed. Hamden, Conn.: Responsive Environments Foundation, 1963.

Moore, O.K. & Anderson, A.R. Some Principles for the Design of Clarifying Educational Environments. In Handbook of Socialization Theory and Research, D. Gosiln (Ed.). Chicago: Rand McNally, 1968.

Newton, G. & Levine, S. Early experience and behavior: The psychobiology of development. Springfield: Charles C. Thomas, 1968.

Nimnicht, G., McAfee, O. & Meier, J. The New Nursery School. New York: General Learning Corp., 1969.

Palmer, F. Learning at two. Children, 16, 55-57.

Pavenstedt, E. A comparison of the child-rearing environment of upper-, lower- and very low-lower class families. Amer. J. Orthopsychiat., 1965, 35, 89-98.

Piaget, J. The origins of intelligence in children. New York: International Univ. Press, 1952.

Pines, M. Revolution in Learning. New York: Harper & Rowe, 1967.

Problems of neonatal intensive care units: Report of the Fifty-Ninth Ross Conference on Pediatric Research. Columbus, Ohio: Ross Laboratories, 1969.

Provence, S. & Lipton, R.C. Infants in Institutions: A comparison of their development with family-reared infants during the first year of life. New York: International Univ. Press, 1962.

Razran, G. The observable unconscious and the inferable conscious in current Soviet psychophysiology: Interoceptive conditioning, sematic conditioning and the orienting reflex. Psychological Review, 1961, 68, 81-147.

Rheingold, H.L. The modification of social responsiveness in institutionalized babies. Monograph of the S.R.C.D., Vol. 21, No. 2, Evanston, Ill.: Child Develop. Publications, 1956.

Rheingold, H.L., Gewirtz, J.L. & Ross, H. Social conditioning of vocalization in the infant. J. Comp. Physiol. Psychol., 1958, 52, 68-73.

Rheingold, H.L. The effect of environmental stimulation upon social and q exploratory behavior in the human infant. B. Foss (Ed.), Determinants of Infant Behavior. New York: Wiley, 1961.

Ribble, M. The rights of infants: Early psychological needs and their satisfactions. New York: Columbia Univ. Press, 1943.

Riessman, F. The Culturally Deprived Child. New York: Harper, 1962.

Rosenzweig, M.R., Bennett, E.L., & Diamond, M.C. Transitory components of cerebral changes induced by experience. Proceedings, 75th Annual Convention, APA, 1967, 105-106.

Sayegh, Y. & Dennis, W. The effect of supplementary experiences upon the behavioral development of infants in institutions. Child Develop., 1965, 36, 81-90.

Schaeffer, E. & Belle, R. Development of a parental attitude research instrument. Child Develop., 1958, 27, 337-361.

Scott, J.P. Critical periods in behavioral development. Science, 1962, 138, 949-956.

Scott, K.B., Jenkins, M.E. & Crawford, R.P. Growth and development of Negro infants: I. Analysis of Birth Weights of 11,818 Newly Born Infants. Pediatrics, 1950, 6, 425-431.

Sears, R.R., Maccoby, E. & Levin, H. Patterns of child rearing. Evanston, Ill.: Row-Peterson, 1957.

Skeels, H. & Dye, H. A study of the effects of differential stimulation on mentally retarded children. Proceedings of American Association on Mental Deficiency, 1939, 44, 114-136.

Spiro, M. Children of the Kibbutz. Cambridge, Mass: Harvard Univ. Press, 1958.

Spitz, Rene. The first year of life: A psychoanalytic study of normal and deviant development of object relations. New York: International Univ. Press, 1965.

Statistical summary of patients served in mental retardation clinics of fiscal year, 1968. U.S. Dept. Health, Education & Welfare, National Center for Social Statistics.

Stott, L. & Ball, R. Infant and preschool mental tests: Review and evaluation. Monographs of the Society for Research in Child Development, 1965, 30, No. 101.

Terman, L.M., et al. Genetic Studies of Genius, Vol. I. Palo Alto, Calif.: Stanford Univ. Press, 1925.

Thompson, W.R. & Melzack, R. Early Environment. Scientific American, 1956, 174, 38-42.

Uzgiris, I.C. & Hunt, J. McV. A scale of infant psychological development. Unpublished manuscript. Urbana: Univ. of Ill.

Uzgiris, I. Ordinality in the development of schemas for relating to objects. Exceptional Infant, Vol. I, J. Hellmuth (Ed.), Seattle: Special Child Publications, 1967.

Valverde, F. & Ruiz-Marcos, A. The Effects of Sensory Deprivation on Dendritic Spines in the Visual Cortex of the Mouse. In Proceedings of Dyslexia Conference, National Research Council Committee on Brain Sciences, 1968.

Weikart, D. & Lambie, D. Preschool Intervention Through a Home Teaching Program. In J. Hellmuth (Ed.) Disadvantaged Child, Vol. II, 1968, pp. 435-501.

White, B.L., Castle, P. & Held, R. Observations on the development of visually directed teaching. Child Develop., 1964, 35, 349-364.

White, B. & Castle, P. Visual exploratory behavior following postnatal handling of human infants. Percept. Mot. Skills, 1964, 18, 497-502.

Wolff, P. & White, B. Visual Pursuit and Attention in Young Infants. J. Amer. Acad. Child Psychiat., 1965, 4, 473-484.

Wright, F.H. A controlled follow-up study of small prematures. Final Report to Children's Bureau, 1969.

Yarrow, L.J. Research in dimensions of early maternal care. Merrill-Palmer Quart., 1963, 101-114.

FIGURE 1.

INSTRUCTIONAL SYSTEM FLOW CHART

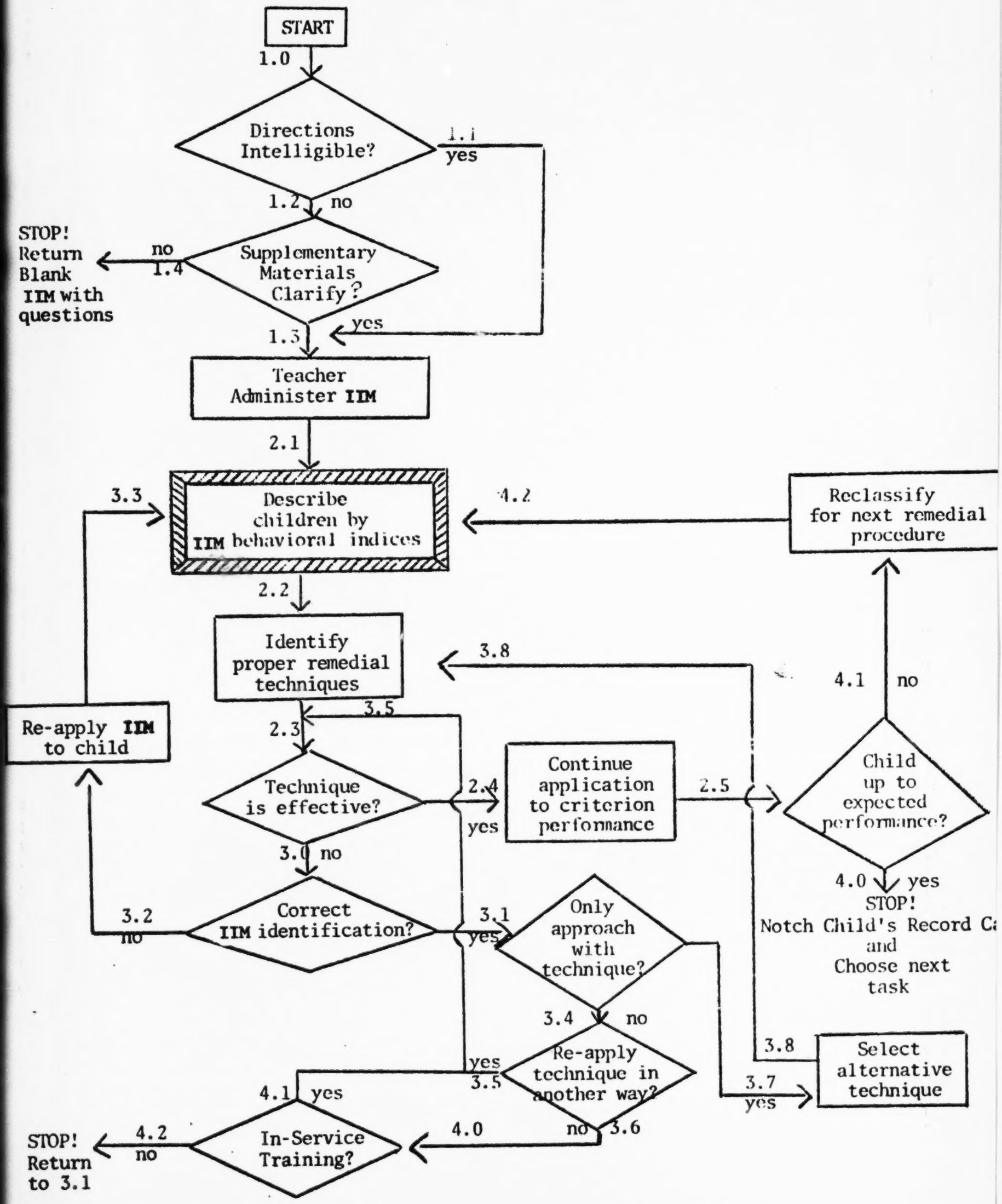
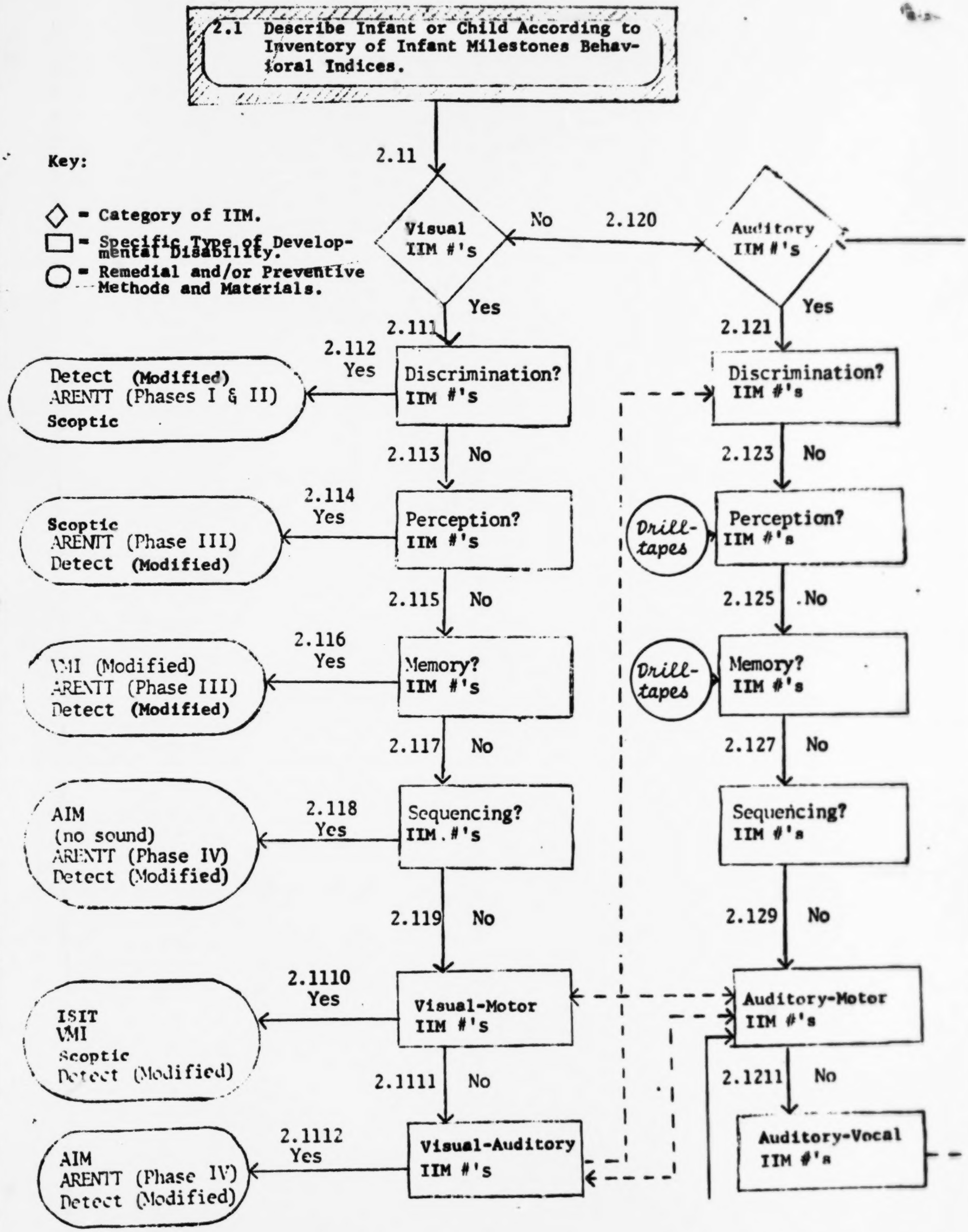


FIGURE 2. PARTIAL VISUAL AND AUDITORY SUBSYSTEMS OF MASTER INFANT EDUCATION SYSTEM.



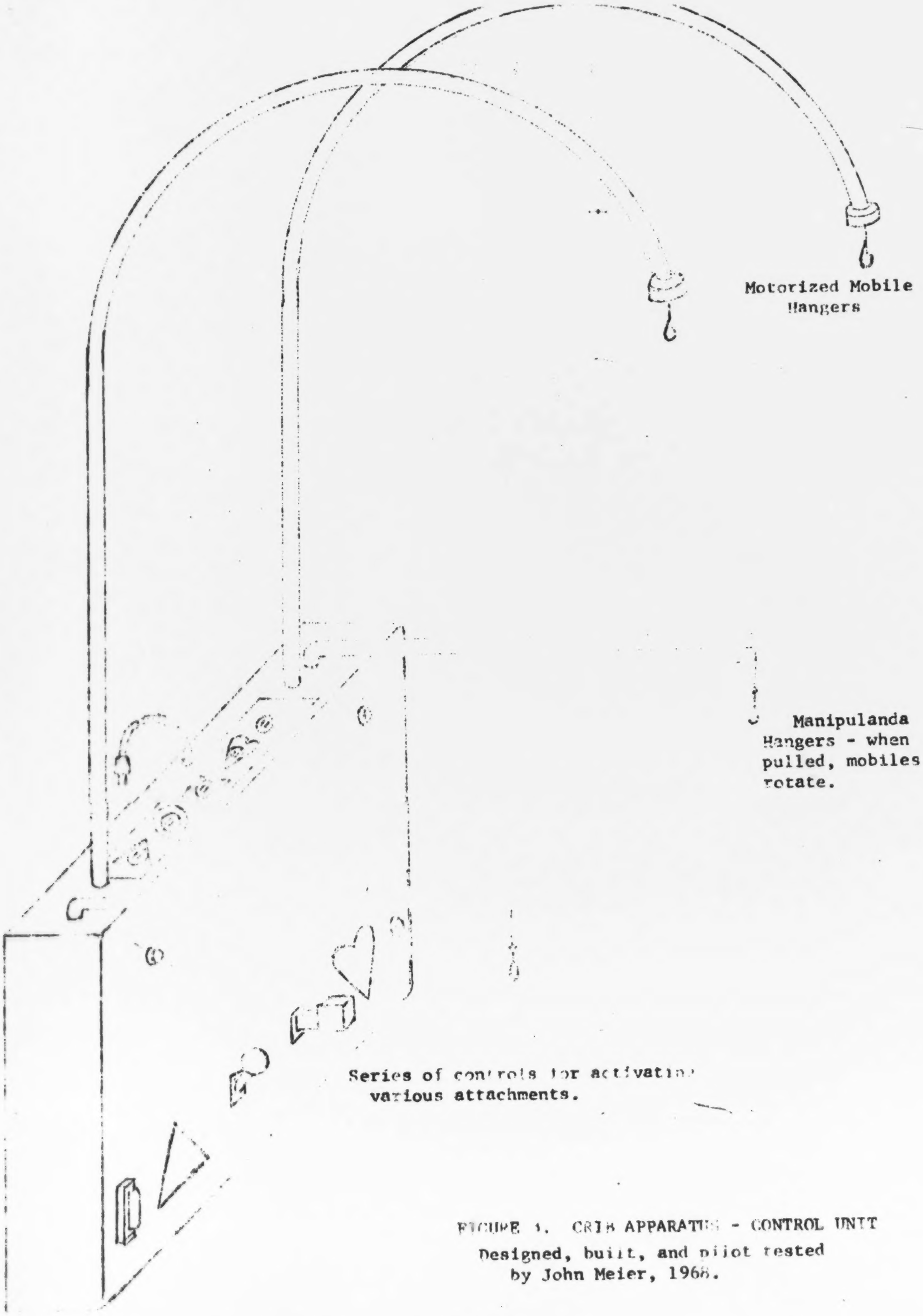
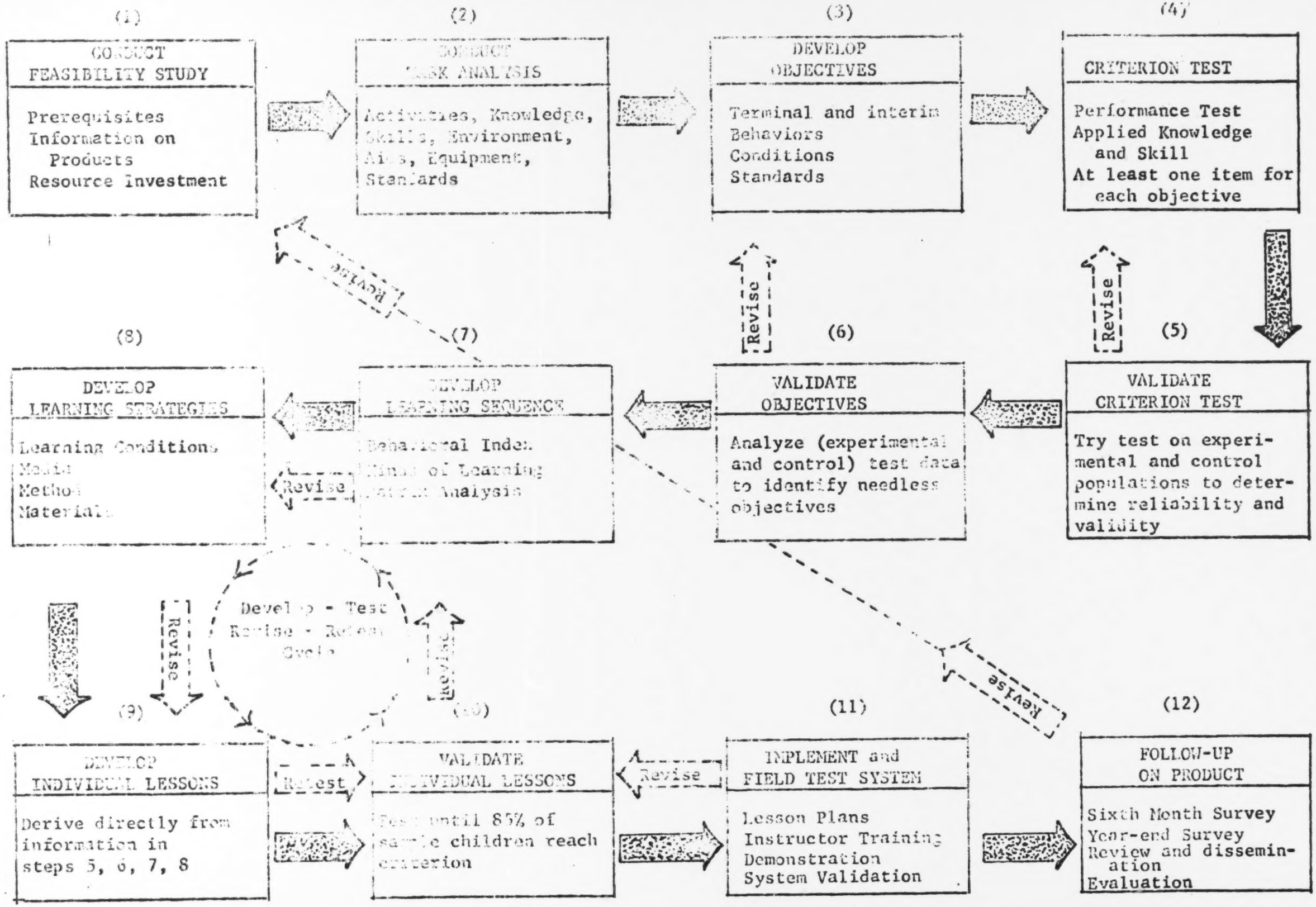

Motorized Mobile Hangers
Manipulanda Hangers - when pulled, mobiles rotate.
Series of controls for activating various attachments.

FIGURE 1. CRIB APPARATUS - CONTROL UNIT
Designed, built, and pilot tested by John Meier, 1968.



*Adapted from Butler, C., Job Corps Instructional Systems Development. RMEL, 1967, p. 48